as regards ash, but the moisture content in such materials is liable to considerable variation. A half-shovelful should be taken from each lot that is weighed and placed at once in a box with close-fitting lid. The collected samples are then spread out on a tared metal tray and accurately weighed. The tray is left in a warm place at a temperature not exceeding 120° F. for about 48 hr., when it is again weighed and the loss of moisture noted. Unwashed small coal may be sampled in the same way, with omission of the air-drying, unless it contains much moisture, when it should be treated exactly as washed coal. In all cases the reduction of the sample to manageable size is effected by the method of quartering. The aggregate samples are broken up on a metal plate to pieces not exceeding 2-in. cubes, well mixed, and piled evenly in a cone, the pieces being allowed to distribute themselves regularly on all sides. The cone is then evenly flattened out and divided by two diameters at right angles; two opposite quadrants are removed, care being taken to include their residual " fines "; the other two are rejected. The retained portion is well mixed and the quartering repeated as often as necessary with progressive reduction in the size of the pieces until only a few pounds is left. For accurate determination of the contained water it is advisable to take a portion at this stage, as in the case of many coals there is rapid loss of a portion of the contained water during fine grinding. The grinding is done in an iron mortar with further quartering until about half a pound is left, which must be reduced to the condition of fine flour. In this state it is spread out overnight in a place free from dust, and is then in the condition of air-dry sample. This is used for the analysis and for determination of heating power.

It cannot be too strongly insisted on that the utmost care is necessary in the case of nearly all coals to ensure the obtaining of a correct sample. Errors of i or 2 per cent are quite easily made in the case of coals containing 10 or 12 per cent of ash, a considerably higher degree of inaccuracy than is likely to occur in the analysis or in the determination of heating power if these are in skilled hands.

Proximate Analysis.—For the control of combustion it is important to ascertain the moisture and ash contents of the coal and in addition the amounts of fixed and volatile matters formed on exposure to heat. These data are supplied by the " proximate analysis ".

Moisture and Ash.—3 grn. of the finely powdered and air-dried coal is heated for i hr. in a suitable oven at 220° F., cooled in a desiccator, and weighed. The loss in weight is taken as moisture. For ash the dry residue from the moisture determination is carefully burned off in a muffle or over a good Bunsen flame till constant in weight.

Volatile Matter and Fixed Carbon.—i gm. of the finely powdered and air-dried coal in a crucible with close-fitting lid is ignited for 2 min. over a Bunsen flame and thereafter, without cooling, for 3 min. over a foot blowpipe. The crucible is then cooled in a desiccator and weighed. The residue is " coke " and, after deduction of the contained ash as determined, gives the " fixed carbon ". The loss on ignition less the ascertained moisture